Claims

What is claimed is:

1. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix comprising lipid, protein, and sugar.

2. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix, wherein the matrix comprises at least three components selected from the group consisting of lipid, protein, sugar, and synthetic polymer.

3. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix, wherein the matrix comprises at least two components selected from the group consisting of lipid, protein, sugar, and synthetic polymer.

4. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix comprising lipid and protein.

5. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix comprising lipid and sugar.

6. A pharmaceutical composition comprising microparticles of an agent encapsulated in a matrix comprising protein and sugar.

7. The pharmaceutical composition of claim 1 wherein the agent is a therapeutic agent.

8. The pharmaceutical composition of claim 1 wherein the agent is a local anesthetic.

9. The pharmaceutical composition of claim 1 wherein the agent is selected from the group consisting of procaine, lidocaine, dibucaine, tetracaine, bupivacaine, mepivacaine, and articaine.

10. The pharmaceutical composition of claim 1 wherein the agent is bupivacaine.

11. The pharmaceutical composition of claim 1 wherein the agent is an anticonvulsant.

12. The pharmaceutical composition of claim 1 wherein the agent is a vasodilator.

13. The pharmaceutical composition of claim 1 wherein the agent is a protein.

14. The pharmaceutical composition of claim 1 wherein the agent is a lipid.

15. The pharmaceutical composition of claim 1 wherein the agent is a glycosaminoglycan.

16. The pharmaceutical composition of claim 1 wherein the agent is a diagnostic agent.

17. The pharmaceutical composition of claim 1 wherein the agent is a prophylactic agent.

18. The pharmaceutical composition of claim 1 wherein the lipid is a naturally occurring lipid.

19. The pharmaceutical composition of claim 1 wherein the lipid is an emulsifier.

20. The pharmaceutical composition of claim 1 wherein the lipid is a surfactant.

21. The pharmaceutical composition of claim 1 wherein the lipid is positively charged.

22. The pharmaceutical composition of claim 1 wherein the lipid is negatively charged.

23. The pharmaceutical composition of claim 1 wherein the lipid has no charge.

24. The pharmaceutical composition of claim 1 wherein the lipid is a phosphatidylcholine.

25. The pharmaceutical composition of claim 1 wherein the lipid is dipalmitoylphosphatidylcholine (DPPC).

26. The pharmaceutical composition of claim 1 wherein the lipid is polyvinyl alcohol.

27. The pharmaceutical composition of claim 1 wherein the lipid is a phospholipid.

28. The pharmaceutical composition of claim 1 wherein the lipid is selected from the groups consisting of phosphoglycerides; phosphatidylcholines; dipalmitoyl phosphatidylcholine (DPPC); dioleylphosphatidyl ethanolamine (DOPE); dioleyloxypropyltriethylammonium (DOTMA); dioleoylphosphatidylcholine; cholesterol; cholesterol ester; diacylglycerol; diacylglycerolsuccinate; diphosphatidyl glycerol (DPPG); hexanedecanol; fatty alcohols such as polyethylene glycol (PEG); polyoxyethylene-9-lauryl ether; a surface active fatty acid, such as palmitic acid or oleic acid; fatty acids; fatty acid amides; sorbitan trioleate (Span 85) glycocholate; surfactin; a poloxomer; a sorbitan fatty acid ester such as sorbitan trioleate; lecithin; lysolecithin; phosphatidylserine; phosphatidylinositol; sphingomyelin; phosphatidylethanolamine (cephalin); cardiolipin; phosphatidic acid; cerebrosides; dicetylphosphate; dipalmitoylphosphatidylglycerol; stearylamine; dodecylamine; hexadecyl-amine; acetyl palmitate; glycerol ricinoleate; hexadecyl sterate; isopropyl myristate; tyloxapol; poly(ehtylene glycol)5000-phosphatidylethanolamine; and phospholipids.

29. The pharmaceutical composition of claim 1 wherein the lipid is a derivatized lipid.

30. The pharmaceutical composition of claim 1 wherein the protein is an albumin.

31. The pharmaceutical composition of claim 1 wherein the protein is a whole cell extract.

32. The pharmaceutical composition of claim 1 wherein the protein is an antibody.

33. The pharmaceutical composition of claim 1 wherein the protein is an enzyme.

34. The pharmacuetical composition of claim 1 wherein the protein is glucose oxidase.

35. The pharmaceutical composition of claim 1 wherein the protein is insulin.

36. The pharmaceutical composition of claim 1 wherein the sugar comprises a mixture of complex and simple sugars.

37. The pharmaceutical composition of claim 1 wherein the sugar is lactose.

38. The pharmaceutical composition of claim 1 wherein the sugar is cellulose.

39. The pharmaceutical composition of claim 1 wherein the sugar is a chemically modified sugar.

40. The pharmaceutical composition of claim 1 wherein the sugar is a glycosaminoglycan.

41. The pharmaceutical composition of claim 1 wherein the sugar is dextran.

42. The pharmaceutical composition of claim 1 wherein the sugar is a chemically modified dextran.

43. The pharmaceutical composition of claim 1 wherein the sugar is chondroitin sulfate.

44. The pharmaceutical composition of claim 1 wherein the sugar is a derivatized sugar.

45. The pharmaceutical composition of claim 1 wherein the sugar is a chemically modified sugar.

46. The pharmaceutical compostion of claim 1 wherein the sugar is selected from the group consisting of galactose, lactose, glucose, maltose, starches, cellulose and its derivatives, methyl cellulose, carboxymethyl cellulose, fructose, dextran and its derivatives, raffinose, mannitol, xylose, dextrins, glycosaminoglycans, sialic acid, chitosan, hyaluronic acid, and chondroitin sulfate.

47. The pharmaceutical composition of claim 1 wherein the ratio of lipid to protein to sugar is approximately 3:1:1.

48. The pharmaceutical composition of claim 1 wherein the lipid comprises 0-99% of the matrix by weight.

49. The pharmaceutical composition of claim 1 wherein the lipid comprises 3-99% of the matrix by weight.

50. The pharmaceutical composition of claim 1 wherein the lipid comprises 20-60% of the matrix by weight.

51. The pharmaceutical composition of claim 1 wherein the protein comprises 0-95% of the matrix by weight.

52. The pharmaceutical composition of claim 1 wherein the protein comprises 10-30% of the matrix by weight.

53. The pharmaceutical composition of claim 1 wherein the protein comprises 1-20% of the matrix by weight.

54. The pharmaceutical composition of claim 1 wherein the sugar comprises 0-60% of the matrix by weight.

55. The pharmaceutical composition of claim 1 wherein the sugar comprises 0.5%-50% of the matrix by weight.

56. The pharmaceutical composition of claim 1 wherein the sugar comprises 10-30% of the matrix by weight.

57. The pharmaceutical composition of claim 1 wherein the microparticles are less than 50 micrometers in diameter.

58. The pharmaceutical composition of claim 1 wherein the microparticles are less than 10 micrometers in diameter.

59. The pharmaceutical composition of claim 1 wherein the microparticles are less than 5 micrometers in diameter.

60. The pharmaceutical composition of claim 1 wherein the microparticles are less than 1 micrometer in diameter.

61. The pharmaceutical composition of claim 1 wherein the microparticles are less than 500 nanometers in diameter.

62. A method of preparing microparticles comprising an agent encapsulated in a lipid-protein-sugar matrix, the method comprising steps of:

providing an agent;

contacting the agent with a lipid, a protein, and a sugar; and

spray drying mixture of the agent, the lipid, the protein, and the sugar to make microparticles.

63. A method of administering an agent, the method comprising steps of:

providing a patient;

providing microparticles of an agent encapsulated in a lipid-protein-sugar matrix; and

administering the microparticles to the patient.

64. The method of claim 63 wherein the step of administering comprises injecting the microparticles into the patient.

65. The method of claim 63 wherein the step of administering comprises placing the microparticles in a body cavity of the patient.

66. A method of administering a nerve block, the method comprising steps of:

providing a patient;

providing microparticles of a local anesthetic encapsulated in a lipid-protein-sugar matrix; and

injecting the microparticles into the patient near a nerve to be anesthetized.

67. The method of claim 66 wherein the nerve is a sciatic nerve.

68. The method of claim 66 wherein the nerve is a femoral nerve.

69. The method of claim 66 wherein the nerve is a inferior alveolar nerve.

70. The method of claim 66 wherein the nerve is a nerve of the brachial plexus.

71. The method of claim 66 wherein the nerve is an intercostal nerve.

72. The method of claim 66 wherein the local anesthetic is bupivacaine.

73. A method of immunizing an individual, the method comprising steps of:

providing an individual;

providing microparticles comprising a prophylactic agent encapsulated in a lipid-protein-sugar matrix; and

delivering an effective amount of the microparticles to the individual to stimulate an immune response.

74. The method of claim 73 wherein the prophylactic agent is an antigen.

75. The method of claim 73 wherein the prophylactic agent is a protein.

76. The method of claim 73 wherein the prophylactic agent is selected from the group consisting of bacterial antigens, viral antigens, protozoan antigens, and parasite antigens.

77. The method of claim 73 wherein the microparticles further comprise an adjuvant.

78. The method of claim 73 wherein the microparticles are at least 5 micrometers in diameter.

79. The method of claim 73 wherein the microparticles are less than 5 micrometers in diameter.